Professor Emile Duclaux, of the French Institute, Paris, France: 'Sur l'actinométrie atmosphérique et sur la constitution actinique de l'atmosphère.'

Professor Doctor Gieseler, of Bonn, Germany: 'Mittlere Tagestemperaturen von Bonn, 1848–88.'

Doctor Ludwig Ilosvay von Nagy Iloosva, Professor in the Royal Joseph Polytechnic School, Budapest, Hungary: 'Ueber den unmittelbar oxydirenden Bestandtheil der Luft.'

Doctor A. Magelssen, of Christiania, Norway: 'Ueber den Zusammenhang und die Verwandschaft der biologischen, meteorologischen und kosmischen Erscheinungen.'

Doctor A. Marcuse, of the Royal Observatory, Berlin, Germany: 'Die atmosphärische Luft.'

Professor C. Nees, of the Polytechnic School, Copenhagen, Denmark: 'The use of kites and chained air-balloons for observing the velocity of winds, etc.'

Surgeon Charles Smart, U. S. A., of Washington: 'An Essay on the Properties, Constitution and Impurities of Atmospheric Air, in relation to the promotion of Health and Longevity.'

Doctor F. Viault, of the Faculty of Medicine, Bordeaux, France: 'Découverte d'une nouvelle et importante propriété physiologique de l'Air atmosphérique (action hématogène de l'air raréfié).'

(Signed) S. P. LANGLEY,
G. BROWN GOODE,
J. S. BILLINGS,
M. W. HARRINGTON.

AUGUST 9, 1895.

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*THE HISTORY, AIMS AND IMPORTANCE OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.*

THE year 1839 was one of great scientific activity in this country, and in the older States regularly organized geological and zoölogical surveys were in progress which had called into the field nearly all the scientific men in the country in various capacities. Many of our earlier scientists owe their fame to the opportunities then offered for solving the great problems in science which were met at every step. At that time science was still in its infancy, and the officers of the several State Surveys felt the necessity of comparing notes and discussing results. As a consequence it was agreed upon among them to form an Association of Geologists and Naturalists which should meet every year and discuss the facts and theories which every man was working out in his own State.

The first meeting of this Association was in Philadelphia in April, 1840, under the presidency of Edward Hitchcock, the head of the Geological Survey of Massachusetts. The second meeting was also held in Philadelphia, the year following, with the eminent chemist, Benjamin Silliman, Sr., of New Haven, as President. This was followed by annual meetings in Boston, Albany, Washington, New Haven, New York, and again in Boston in 1847, under the succession of Presidents: S. J. Morton, Henry B. Rogers, John Lock, William B. Rogers, C. T. Jackson and William B. Rogers for a second time, all of whom were prominent in their respective lines of research and each of whom has left an honored mark on the annals of American science.

At the meeting of 1847 in Boston it was found that during the seven years of the existence of the Association the kindred sciences of mathematics, astronomy, physics, chemistry, geography and ethnology had gained many devotees in this country. Such advances had been made in these sciences as to show the necessity of broader views and more general coöperation among the workers in all departments of science. It was therefore resolved to enlarge the scope of the existing association and to

take in all the sciences by changing the name to The American Association for the Advancement of Science.

In 1848 the new association met in Philadelphia, the birth-place of its predecessor, and adopted the constitution which in all its vital points has remained unchanged to this time. The first clause of this constitution is as follows: "The objects of the Association are, by periodical and migratory meetings, to promote intercourse between those who are cultivating science in different parts of America, to give a stronger and more general impulse and more systematic direction to scientific research, and to procure for the labors of scientific men increased facilities and a wider influence." Acting under this clause the Association has held forty-three meetings in the following cities: Philadelphia twice (in 1848 and 1884), Cambridge, Charleston, New Haven, Cincinnati twice (in 1851 and 1881), Albany twice (in 1851 and 1856), Cleveland twice (in 1853 and 1888), Washington twice (in 1854 and 1891), Providence, Montreal twice (in 1857 and 1882), Baltimore, Springfield, Newport, Buffalo three times (in 1866, 1876 and 1886), Burlington, Chicago, Salem, Troy, Indianapolis twice (in 1871 and 1890), Dubuque, Portland, Hartford, Detroit, Nashville, St. Louis, Saratoga, Boston, Minneapolis, Ann Arbor, New York, Toronto, Rochester, Madison and Brooklyn.

At first it was contemplated to hold two meetings each year, one in the early spring, mainly in the Southern cities, and the other in the summer in the more Northern cities. Thus two meetings were held in the years 1850 and 1851, but no meeting was held in 1852. The large number of members connected with colleges and schools soon made it essential to hold the meetings annually during the summer vacation. In 1859 a meeting was held in Springfield, and in 1860 at Newport. The fifteenth meeting was to have been held in Nashville, but was suspended owing to the unhappy condition of the country. Five years later the meeting was held in Buffalo, when 79 members rallied to revive the meetings which have since that time been annually increasing in importance and have been attended by from 200 to 1000 members according to special circumstances and to locality.

The Association has now about 2000 names on its roll of members, and it has called to its annual meetings the principal societies of a national character, which, largely as offshoots from the Association, hold annual meetings as affiliated societies in connection with the Association. During the existence of the Association there has been on its roll the name of nearly every man and woman of eminence in science in the country, as well as many others equally distinguished in literature and art; while hundreds of men and women have found in the membership of the Association the opportunity of increasing their knowledge by contact with professional workers in science, and have had their minds made broader and their lives more useful as a consequence. The influence of the Association, meeting as it does in various parts of the country, has unquestionably been of the greatest importance to the people in bringing scientific methods and results to their notice; and it is beyond question that many a young mind has been led to pursue a life of scientific research in consequence of incentives derived from these annual gatherings.

The men who have held the position of President since 1848 are such a guarantee of the high character of the Association and the diversity of its interests that it is well to mention the names of Rogers, Redfield, Henry, Bache, Agassiz, Pierce, Dana, Torrey, Hall, Caswell, Alexander, Lea, Barnard, Newberry, Gould, Foster, Hunt, Gray, Smith, Lovering, J. L. LeConte, Hilgard, Newcomb, Marsh, Barker, Morgan, Brush,

Dawson, Young, Lesley, Newton, Morse, Langley, Powell, Mendenhall, Goodale, Prescott, Joseph LeConte, Harkness, Brinton, Morley.

In 1874 the Association was incorporated by a special act of the Legislature of Massachussetts, and it has authority to hold both personal property and real estate. The official home of the Association is in Salem, Mass., where there is an office in charge of the Assistant Secretary, where are kept the publications of the Association and a scientific library of considerable importance. The proceedings of each meeting are published in an octavo volume of several hundred pages, containing the addresses of the President and Vice-Presidents, reports of special committees, and more or less extended abstracts of the two or three hundred papers read at the meeting. Besides the annual volume of proceedings, a quarto number of the memoirs has been published by the generous gift of Mrs. Elizabeth Thompson, the first Patron of the Association. Several volumes of the Association have been reprinted by the liberality of Mrs. Esther Herrman, General William Lilly and Mrs. Thompson, the three Patrons of the Association.

Members of the Association are elected by the Council after nomination by two members of the Association. Upon election members pay $5 admission fee. There is an annual assessment of $3 which entitles members to all the privileges of the meetings and to the annual volume of proceedings. From such members as are engaged professionally in scientific work, or have by their labors advanced science in any of its departments, the Council elects the Fellows on nomination from the sections. It is from the Fellows that all officers of the Association are chosen, and thus the management of the Association is kept in the hands of professional scientists, while its doors are open wide to all who are interested in its objects and wish to be benefited by participation in its meetings.

Any individual who may give $1000 or more becomes a Patron of the Association. Any member may become a life member by the payment of $50 at one time which exempts him from the annual assessment. The income of the $50 is used for current expenses of the Association during the life of the member; afterward the principal is added to the Research Fund. The interest of this fund is devoted to encourage original research. The Research Fund now amounts to nearly $6000. The first grant from this fund was made at the New York meeting in 1887 to Professors Michelson and Morley to aid them in their important researches for the establishment of a standard of length. From this fund, secured by small savings, the Association has already in eight years been able to make grants amounting to $2200 in aid of important scientific research. The time will undoubtedly come when this fund will be greatly increased by the Association being made the almoner of patrons of science.

At the present time the Association is divided into nine sections as follows: A. Mathematics and Astronomy; B. Physics; C. Chemistry; D. Mechanical Science and Engineering; E. Geology and Geography; F. Zoölogy; G. Botany; H. Anthropology; I. Economic Science and Statistics. Each of these sections is presided over by a Vice-President of the Association, and each has its secretary and special committees.

During the week of the Association meeting, in any city, two free evening lectures are generally given by the Association complimentary to the citizens. The general sessions, the presidential address and the addresses of the nine vice-presidents, and all the meetings of the sections, are free to all who wish to attend.

The triumphs of science have been many and great. By it mankind has been bene-

fited and civilization advanced. Grand possibilities lead her votaries on in the hope of still greater achievements than any yet accomplished. The diffusion and advancement of scientific knowledge are the objects of the Association for the Advancement of Science.

F. W. Putnam.

*Permanent Secretary, A. A. A. S.*

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*BOLOMETRIC INVESTIGATIONS IN THE INFRA-RED SPECTRUM OF THE SUN.**

When Sir Isaac Newton allowed a beam of light to fall upon a triangular bar of glass, and thus demonstrated the complexity of ordinary light, he undoubtedly rendered science a great service: but when he stopped there, and said that all transparent substances affected light both qualitatively and quantitatively alike, he did it an injury almost as great. The weight of his word deterred investigators and retarded the development of this branch of optics for very many years. At last it was shown that all transparent substances affect light differently. Some bend all the colors considerably out of their course, while scattering or 'dispersing' them but slightly. Others bend, or 'refract,' but slightly, and 'disperse' considerably. In general the violet is 'refracted' most, followed by blue, green, yellow, orange and red, which is refracted least. Similarly, Newton's advocacy of the theory that light is material particles, 'corpuscles,' thrown out from the luminous body, added to the difficulties of gaining a general acceptance of the rival theory, which sees in light only a periodic, or 'wave,' motion, in a hypothetical elastic medium. To-day every scientist accepts the undulatory, or wave, theory of light and is even striving to make it unite the phenomena of light and electricity in one common explanation.

Long after Newton's corpuscles had passed out of science, 'caloric,' or the heat fluid, still maintained its list of respected advocates, and it remained for the first half of this century to relegate 'caloric' to the curiosity shop along with the 'corpuscles.' Then it was that heat was recognized as another manifestation of those periodic disturbances, or waves, in that elastic medium which was then known as the luminiferous ether, and which is now universally referred to as 'the ether.' In 1802 Wollaston, upon repeating Newton's experiment, discovered certain dark bands traversing the colors and apparently separating them. Some ten years later Fraunhofer made these bands the subject of very extensive and careful investigation, observing several hundred and mapping and naming the more important among them. These lines are commonly known now as 'Fraunhofer lines,' and are used as milestones in the spectrum. Thanks to the labors of Wollaston, Fraunhofer, Brewster, Angstrom, Kirchoff, Bunsen and many others in less degree, we know that a chemical element, as sodium, when its vapor is heated sufficiently, will radiate only certain kinds of light; sodium, yellow; thallium, green; lithium, red, and so on. The light from any white-hot solid, when passed through a prism, is dispersed into a spectrum having all the colors and no dark lines, that is, a 'continuous spectrum.' If we put soda in an alcohol flame it will emit yellow light, which, being sent through a prism, will not give a continuous spectrum, but only a band of yellow at that place where the yellow would come in a continuous spectrum. Now, if the light of a white-hot solid, electric arc-light, for example, be caused to pass through the soda flame and then be dispersed into a spectrum, we shall find the latter to be continuous, except for a dark band at exactly that part of the yellow where the soda flame gave a yellow band. The soda vapor in the alcohol flame absorbed out of the white light just

* Part of a popular lecture under the auspices of the New York Academy of Sciences.